REMARKS

Claims 1-6 and 8-10 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Lee et al. (US 2002/0100725) in view of Terry et al. (2,746,839). Also, claim 7 has been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Lee et al. in view of Terry et al. and further in view of Reneker (6,520,425). These rejections are respectfully traversed.

The present invention is directed to a process of preparing a continuous filament composed of nanofibers which utilizes a plurality of process steps including spinning at least one polymer spinning dope through nozzles onto a collector surface of water or an organic solvent which has a conductive material dispose below the surface of the collector, and applying a high voltage to the nozzles and the conductive material, wherein the nanofibers spoon onto the surface of the water or organic solvent are pressed, drawn, dried and wound while being pulled by a rotary roller.

Under the heading "Background Art" found on page 1 of the present application, the Applicants discuss various conventional techniques, for example, the sea-island type conjugated spinning method or the blend spinning method wherein one of two polymer components consisting of a fiber must be dissolved and removed for making ultrafine fiber. As discussed at the bottom of page 2 of the present application, conventional electrospinning methods can produce only a web or non-woven fabric composed of a nanofiber of less than 1000nm. Accordingly, to prepare a continuous filament by the conventional electrospinning method, the produced nanofiber web has to be cut to a predetermined length to produce a staple and this staple has to undergo additional spinning to produce spun yarn, which makes the process complicated. The present invention is intended to prepare a continuous filament composed of a nanofiber which is superior in physical properties and is suitable for various industrial materials such as filters, diapers, sanitary pads, artificial vessels, artificial leather, and the like.

The Lee et al. patent relied upon by the Examiner is not concerned with a process of preparing a continuous filament, as recited in all of the claims of the present application but rather is directed to a method for preparing a thin fiber-structured polymer web, which, as discussed in the specification of the present application, merely represents the state of the art. Thus, as repeatedly stated in Lee et al., the method disclosed therein is directed to preparing a thin fiber-structured polymer web suitable for a high-speed and large-scale production using electrospinning. As noted in Col. 2, paragraph [0010], the polymer web obtained in Lee et al. is a laminated 3-dimensional network structure of fibers having a diameter of from several nanometers to several thousands of nanometers and has a very large surface area per unit volume. Thus, it is clear that Lee et al. are not concerned with a process for preparing a continuous filament as defined by the present invention. This difference between the present invention and Lee et al. is further evidenced by the fact that the reference patent is not concerned with a means for collecting a continuous filament such as the method steps defined by elements 6-13 of the present application, that is, pulling the continuous filament by a rotary roller (element 6), tensioning the continuous filament (element 7), pressing the continuous filament (element 8) drawing the continuous filament (elements 9, 10 and 12), drying the continuous filament (element 11) and winding the continuous filament (element 13). Since Lee et al. do not form a continuous filament but rather a thin-fiber-structured polymer web, it is understandable why the referenced patent does not contain the subsequent treatment steps as recited in the claims of the present application.

Furthermore, Lee et al. do not teach or even remotely suggest spinning the fibers onto the surface of water or an organic solvent as a collector. In fact, as shown in paragraph [0042], the collector utilized in Lee et al. is not water or an organic solvent but rather an accumulation plate is placed on a conductive collector in order to accumulate the polymer web material. This is understandable since the patentees are not concerned with forming a continuous filament but rather are only concerned with preparing a thin fiber-structured polymer web. Thus, in the case of Lee et al., an accumulation plate is placed on the conductive collector and thus they are in juxtaposition with respect to each other whereas in the present invention, the conductive material

is disposed below the collector surface (that is, the surface of the water or organic solvent) a predetermined distance, such as for example, a distance of 0.01 to 200 mm or a distance of 5 to 50 mm as recited in claims 3 and 4 of the present application, respectively. As noted on page 4 of the present application, in forming a continuous filament it is important to spin the polymer spinning dope on a collector surface of water or organic solvent which is disposed a predetermined distance above the conductive material because if this distance (h) is too small, the spun metal fiber would be placed in direct contact with the surface of the conductive material (5), as is the case in the prior art, which would make it difficult to pull the continuous filament away by the rotary roller 6, thereby making the process difficult. On the other hand, if this distance (h) is too large, the voltage applied to the conductive material (5) is not transferred well to the surface of water or organic solvent, thereby making the collected state of the nanofiber very poor.

In further distinctions of the present invention from Lee et al., the reference patent does not show that the fibers which are caught between the surface of water or an organic solvent are pressed, drawn, dried, and wound by roller. This is understandable since Lee et al. are not concerned with the process for preparing a continuous filament but rather directed to a method for the preparation of a thin fiber-structured polymer web. Accordingly, there is no recognition that the distance (d) from one end of the dropping spot of the nanofibers to the initial point where the nanofibers are pulled by the rotary roller is more than 1 cm. As noted on page 5 of the present application, if the distance (d) is less than 1 cm , the spun nanofibers are pulled up in a state that is not sufficiently coagulated, thereby making the production of a continuous filament very difficult.

From the above discussion it is clear that because Lee et al. are concerned with a method for preparing a thin fiber-structured polymer web and not with a method for preparing a continuous filament, the prior art reference suffers from a plurality of deficiencies, and as such is totally ineffective as a primary reference in rejecting the claims of the present application. In any event the Examiner has turned to Terry et al. in an attempt to solve these deficiencies.

However, in combining references to reject the claims under 35 USC 103, there must be some suggestion in either the primary or secondary references as to why it would be obvious to one skilled in the art to modify the teachings of the primary reference with the teachings of the secondary reference. In the present situation, the secondary reference, that is, Terry et al. does not even appear to be remotely related to the process of manufacturing nanofibers utilizing voltage applied to spinning nozzles and collector surfaces. In fact, Terry et al. appear to be only directed to a very common type of thread spinning process in which a plastic material is merely spun through an orifice into a coagulation bath wherein the spinning is effected by a differential pressure upon the solution of the plastic material between opposed faces of a plate. Thus, the similarity between the method of spinning shaped filaments of plastic material as defined in Terry et al. is materially different from the electrospinning method defined in Lee et al. Thus, one skilled in the art, with both Lee et al. and Terry et al. before him cannot possibly arrive at the Applicants' inventive contribution without dissecting bits and pieces from each of the references and recombining them in an attempt to arrive at a process of preparing a continuous filament of nanofibers as defined by the claims of the present application.

In rejecting claims 1-6 and 8-10 of the present application, the Examiner appears to recognize the many deficiencies in Lee et al. and Terry et al. as they are applied to particular claims, but concludes that many of the features of the present invention are considered to be merely a "control variable" which the Examiner dismisses as merely representing an optimum value which involves only routine skill in the art. However, the so-called optimum values recited in the claims of the present application are the direct result of a specific process for preparing a continuous filament, that is, spinning a polymer spinning dope onto a collector surface of water or an organic solvent which has a conductive material disposed below the collector surface of the water or organic solvent. This particular disposition of the collector surface relative to the conductive material for producing a continuous filament brings into play many of the parameters recited in the claims of the present application. Since Lee et al. and Terry et al. do not recognize the Applicants' inventive contribution as set forth above, all of the many features of the present invention which are considered to be merely controlled variables do

not even come into play and thus the optimization of such variables cannot even be contemplated by Lee et al. or Terry et al., either alone or in combination.

In paragraph 8 on page 8 of the Examiner's Office Action letter, the Examiner argues that the motivation to combine the teachings of Lee et al. and Terry et al. patents is to dissolve the solvents from the plastic material being spun. However, this conclusion does not address the use of water or a solvent as a collection surface which is not recognized by either of the references relied upon by the Examiner either alone or in combination.

Claim 7 has been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Lee et al. in view of Terry et al. and further in view of Reneker. In view of the many deficiencies pointed out hereinabove in connection with Lee et al. and Terry et al., the further reliance upon Reneker cannot possibly suggest the subject matter of claim 7 which, because of its dependency upon claim 1, contains all of the limitations of claim 1.

Accordingly, in view of the above remarks reconsideration of the rejections and allowance of all of the claims of the present application are respectfully requested.

In the event that the Request for Reconsideration does not place the present application into condition for allowance, entry thereof is respectfully requested as placing the present application into better condition for appeal.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Joseph A. Kolasch Reg. No. 22,463 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

By_____

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